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Influence of AC electric field on the charge generation in albumin solution in a flow-based AFM-fishing system

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Previously [1], with the example of albumin detection, we demonstrated that application of AC electric fields to AFM chips can well be used for the enhancement of sensitivity of proteomic AFM-fishing systems. This allowed us to attain 10^{-17} – 10^{-18} M detection sensitivity. As was noted in the same paper, the efficiency of albumin fishing correlated with the generation of charge, which occurred upon inflow of protein solution into the measuring cell.

The present study considers the influence of AC electric field on a charge accumulation in the measuring cell of a flow-based AFM-fishing system for the detection of low-abundant proteins. The charge is generated in a femtomolar (10^{-15} M) albumin solution, which is flowing through the injector of this system. It has been demonstrated that the sinusoidal electric field (100 V, 50 Hz) stimulates the accumulation of charge in the measuring cell upon inflow of protein solution at 38°C temperature. Accounting for this effect is important for the development of novel highly sensitive flow-based proteomic and diagnostic systems for AFM-fishing, as well as for the development of models describing the impact of electric field on hemodynamics and physico-chemical properties of water and aqueous solutions.

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1. T.O. Pleshakova, K.A. Malsagova, A.L. Kaysheva, et al., *FEBS Open Bio* **7**, 1186 (2017).